

# PATENT SPECIFICATION

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 (72) Inventor HANS SCHINDLER



## (54) IMPROVEMENTS IN OR RELATING TO LIGHTERS WITH PIEZOELECTRIC IGNITION

(71) We, BRAUN AKTIEN-GESELLSCHAFT, a German Body Corporate, of 22 Rüsselsheimer Strasse, D 6000 Frankfurt-am-Main, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to lighters with piezoelectric ignition and having a case which contains an igniting mechanism and a fuel reservoir provided with a valve and a jet tube or nozzle, the igniting mechanism comprising a piezoelectric device associated with a spring-loaded hammer in a depressible housing and having external connections for producing a spark discharge between the jet tube and an adjacent electrode when the hammer housing is depressed by an actuating member which also operates a valve lifter for opening the valve. A lighter having the features set out above is hereinafter referred to as a "lighter with piezoelectric ignition of the kind referred to".

Lighters with piezoelectric ignition have a piezo crystal which, as the result of mechanical contractions, produces charges at its electrodes and consequently electrical potentials which serve to produce an igniting spark. Specific difficulties in producing sparks in lighters with piezoelectric ignition tend to arise in the mechanism for striking the piezo crystal sharply so that as high an igniting voltage as possible is produced. Many proposals have been made as to how these difficulties can be overcome. The best known are those proposals which envisage a column-shaped hammer, guised in a hammer housing, and moved by physical force against a resilient resistance on to the piezo crystal to strike the latter when a resistance threshold is exceeded. In order to be able to move this hammer on to the piezo crystal in a convenient manner, specifically designed operating buttons have to be provided.

An arrangement is already known for

activating the igniting mechanism and the burner valve of lighters by an actuating element and a valve lifter opened against a valve spring by the actuating element. This arrangement is characterised in that the valve lifter is arranged so as to be slid axially by the actuating element parallel to the axis of the burner valve. The actuating element is arranged in such a way that it can be pivoted about an axis parallel to the longitudinal axis of the lighter.

Underlying the invention is the problem, in a lighter with piezoelectric ignition in which the movement of an actuating button produces an igniting spark and also opens a valve for the jet tube of the fuel reservoir, of keeping the force required to move the actuating button small and steady throughout the whole operating process.

The present invention resides in a lighter with piezoelectric ignition of the kind referred to wherein, for assembly, the valve lifter and the igniting mechanism are inserted in the case through an opening in the upper end thereof, and the valve lifter pivots about a spindle held in a guide in the case and engages at one side beneath a formation on the jet tube and at the other side beneath a capping at the upper end of the depressible hammer housing, the spindle being embraced in a claw-like manner by a contact from which a lead extends to the igniting mechanism, a pointed electrode being supported adjacent the jet tube by a carrier member which is also retained in a guide in the case, and wherein an actuating button is pivotable about a pin held in the case and carries a roller operative upon a curved upper surface of the capping to depress the hammer housing.

The connection of the spindle-embracing contact to the igniting mechanism is preferably made by pressure contact as the result of inserting the mechanism in the case. In a particularly advantageous arrangement according to the invention the actuating button has a curved underface

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with a recess to take the roller, the spacing of the roller from the pivot pin and the curvature of the top being such that, throughout the range of pivotal movement of the actuating button, the force to be applied remains approximately constant.

A particular advantage obtained by the invention is that the force to be applied for operating the igniting mechanism can be very small and can be held constant during the whole of the operating motion.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawing in which:—

Figure 1 is a perspective view of a lighter according to the invention, and

Figure 2 is an exploded view of the individual parts of the lighter shown in Figure 1.

Figure 1 shows a lighter case 1 having a cap 2 over a burner jet (not illustrated) which is provided with an opening 3 for the flame and a number of ventilation holes. Beside cap 2 is arranged an actuating button 5 on a pivot pin 6 fixed in the case 1. The actuating button has side parts sinking into the case and a knurled or roughened upper face 7 of height increasing with distance from the jet, so that non-slipping operation of the button 5 is made possible.

Figure 2 shows some individual parts of the lighter illustrated in Figure 1, cap 2 having been removed. A burner jet tube 8 has a notch 10 and projects out of the case 1 through a nut 9. The case 1 itself is provided with a milled out section 11 to take the cap 2, a hole 12 to take the spindle 6 and guides 13, 14 to take an electrode carrier member 15 and a spindle 16. The spindle 16 passes through side plates of a valve lifter 17, which has a U-shaped front part 18 and a U-shaped back part 19. Spindle 16 is embraced in a claw-like manner by a contact 20 to which is attached an electric wire 21 secured to a plate 23 provided with a screw 22.

On the electrode carrier member 15 already referred to is located a pointed electrode 24, to which is attached an electric lead 25. This electric lead 25 is led through an insulating sleeve 26 and connected to a contact of a piezo crystal (not illustrated). The piezo crystal is located in a sheath 27 in which is fitted a rectangular hammer housing 28 with a hammer (not illustrated). This hammer housing 28 has an upper capping 29 with a curved upper surface and a projecting part 30. The projecting part has a notch through which the lead 25 can be led.

As apparent from Figure 1, the actuating button 5 projects in the ready state only slightly from the case 1. Beneath the upper surface 7, the actuating button 5 has a part

31 the outer shape of which is adapted to the curved upper surface of the capping 29. This part 31 can be completely inserted into case 1 and has at its curved underface a recess 32 in which can be inserted a roller 35 with mounting pins 36. In addition, a hole 33 to take the spindle 6 and a recess 34 are provided in this part 31.

The individual parts shown in Figure 2 can be assembled into a lighter to the form shown in Figure 1 by inserting into case 1, in which is already located a fuel reservoir with jet tube 8, the plate 23 with the attached wire 21, the plate moving downwardly as indicated but also rearwardly to the bottom of the case. The housing 27 is pushed on to this plate 23, so that cap 29 disappears inside case 1. The valve lifter 17 is then placed with its front part 18 over the nut 9, after which spindle 16 is fitted into the guide 14. The rear portion 19 of the valve lifter 17 then lies beneath part 30 of the capping 29. Over the front portion 18 of the valve lifter 17 is placed a washer (not illustrated) guided by the jet tube 8, and retained by means of a snap ring engaging in the notch 10. Pressure on the capping 29 causes the rear portion 19 of the valve lifter 17 to lie against the capping. Into guide 13 is fitted the electrode-carrying member 15 on which is located the electrode 24.

Following this, the roller 35 is inserted in the recess 32 of part 31 and the actuating button 5 pushed into case 1. In order to retain this actuating button, pivot pin 6 is now pushed through the holes 12 and 33. Cap 2 is then clipped over the jet tube 8, from left to right over a guide located at the edge of the milled out portion 11.

To operate the lighter, the actuating button is swivelled away backwards from the flame opening 3. This causes the roller 35 to run on the upper surface of the capping 29 and the hammer housing 28 to be moved downwards. Inside this housing is located a hammer which forms part of an igniting mechanism and which is spring loaded by a spring 38 against the direction of movement. When a defined threshold is exceeded by the pressure on the capping 29, a pin 37 fixed to the hammer is moved suddenly, first laterally and then downwardly, and the hammer impacts the piezo crystal (not illustrated), so that a difference in potential sufficient for spark discharge is produced between the contact 20 and the electrode 24. The spark discharge takes place between the pointed electrode 24 and jet tube 8, because the latter is galvanically connected to the electrode 20. Since with the downward movement of the capping 29, the rear portion 19 of the valve lifter 17 is moved downwardly by roller 35 to raise the front

portion 18, jet tube 8 is lifted and a valve, (not illustrated), is opened. The spark discharge thus takes place across a mixture of gas and air which is thereby caused to ignite. When the actuating button 5 is released, the hammer is propelled upwards by means of the spring 38, the valve is closed and the lighter resumes the condition shown in Figure 1.

10 WHAT WE CLAIM IS:—

1. A lighter with piezoelectric ignition of the kind referred to wherein, for assembly, the valve lifter and the igniting mechanism are inserted in the case through an opening in the upper end thereof, and the valve lifter pivots about a spindle held in a guide in the case and engages at one side beneath a formation on the jet tube and at the other side beneath a capping at the upper end of the depressible hammer housing, the spindle being embraced in a claw-like manner by a contact from which a lead extends to the igniting mechanism, a pointed electrode being supported adjacent the jet tube by a carrier member which is also retained in a guide in the case, and wherein an actuating button is pivotable about a pin held in the case and carries a roller operative upon a curved upper surface of the capping to depress the hammer housing.

2. A lighter according to claim 1, wherein the connection of the spindle-embracing contact to the igniting mechanism is made by pressure contact as the result of inserting the igniting mechanism in the case.

3. A lighter according to claim 1 or 2, wherein the actuating button has a curved underface with a recess to take the roller, the spacing of the roller from said pivot pin and the curvature of the upper surface of said capping being such that, throughout the range of pivotal movement of the actuating button, the force to be applied remains approximately constant.

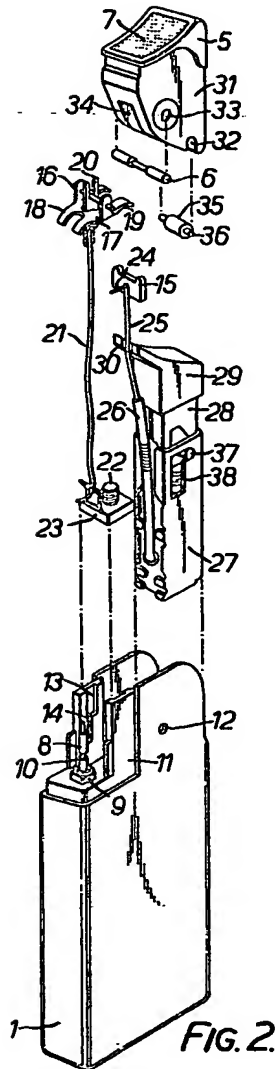
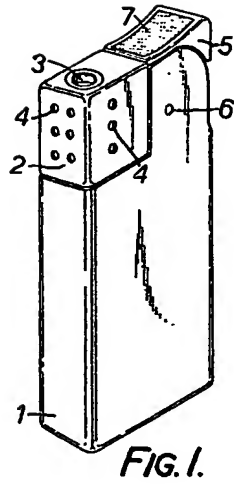
4. A lighter according to claim 1, 2 or 3, wherein the actuating button has side parts sinking into the case and has a knurled or roughened upper face of height increasing with distance from the jet.

5. A lighter with piezoelectric ignition substantially as herein described with reference to the accompanying drawing.

ARTHUR R. DAVIES  
Chartered Patent Agents,  
27, Imperial Square,  
Cheltenham,  
and  
115, High Holborn,  
London, W.C.1.  
Agents for the Applicants

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